microPHAZIR™ User Manual

Thermo Scientific Handheld Near-Infrared Analyzer

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1. Introduction

The microPHAZIR™ is an integrated handheld spectral analyzer that includes a near infrared spectrometer, light source, probe, computer, color LCD display and batteries. It is designed to analyze diffuse reflection measurements from solids, powders or other reflective materials in a wide range of applications. An accessory for transmission measurements of materials such as liquids is available as well.

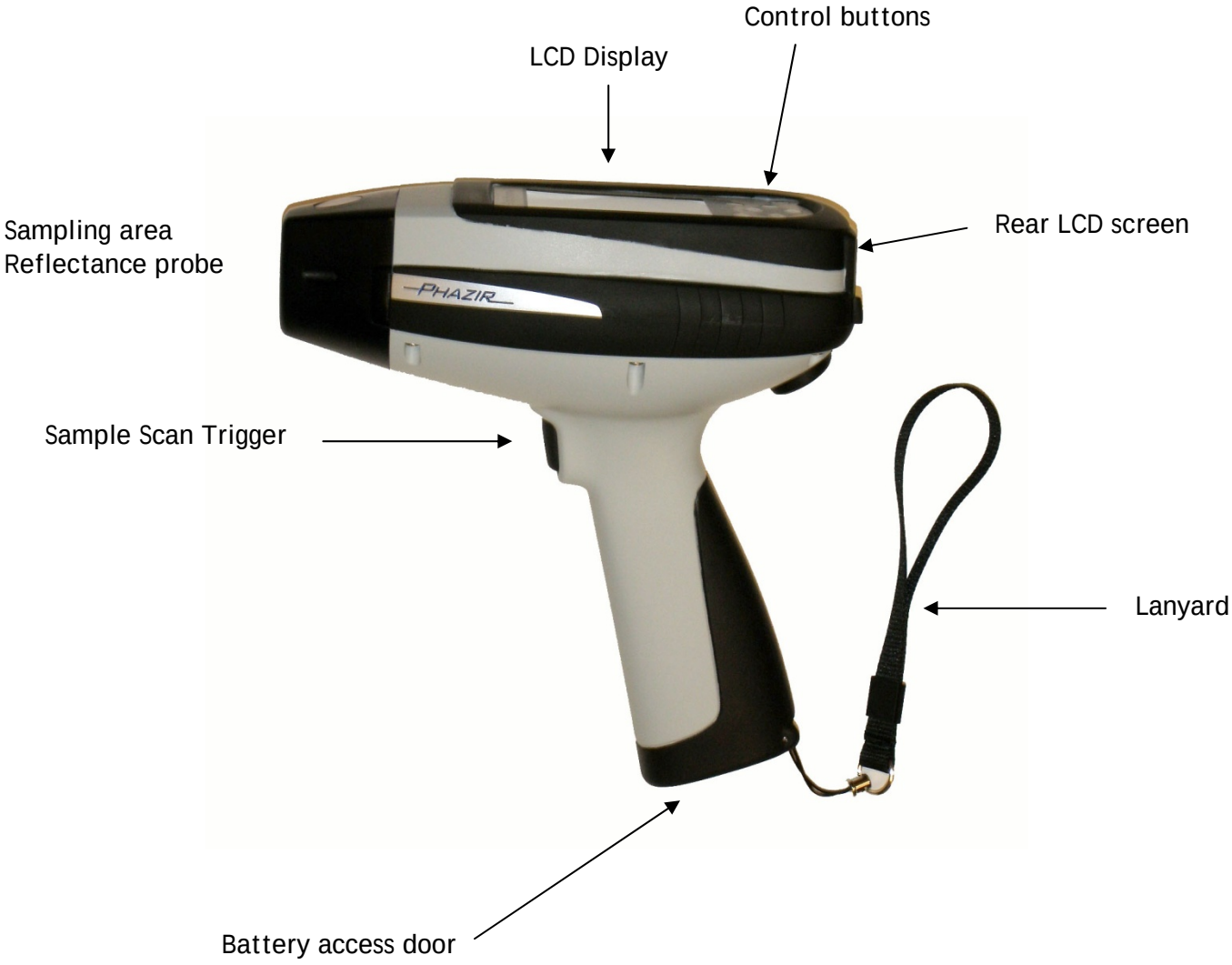
The instrument uses a scripting language to define applications that can be operated by users with minimal training and little or no spectroscopy experience. Separate scripts are written for each application, enabling a single device to function successfully for many applications in many fields.

This manual provides detailed operating instructions and information on the operation and care of the microPHAZIR™.

1.1 microPHAZIR Overview

The microPHAZIR™ was developed using Thermo Scientific's unique MEMS (Micro-Electro-Mechanical System) technology that enables the construction of spectrometers that have no moving parts, are small, and use little power. These characteristics are ideal for the fabrication of hand-held instruments.

An overview of microPHAZIR™ is shown in below.



1.2 Specifications

microPHAZIR™ Handheld NIR Analyzer

Spectral Range	1600-2400nm (6,250 – 4170 cm-1
Pixel Spacing	8nm
Optical Resolution	11nm
Stray Light	<0.01%
Measurement Interface	Diffuse reflectance (Optional, Liquid Vial Adapter) Contact Thermo Scientific for application specific probes
Weight	2.75 lbs. (1.25 kg.)
Hardware Interface	Mini-USB communication port for Windows XP or Vista data download
A/D Converter	24 bit
Detector	Single InGaAs
Display	Color LCD transflective 3.5” diagonal dimension; Black & white rear LCD display
Controls	Scan trigger, 4 navigational buttons, 2 soft buttons, main power button
Battery operational life	At least 6 hrs. full operation with new charged battery. Built in features for extended non-operational power saving
Batteries	Rechargeable / swappable Lithium-Ion
Battery charger	110/220 AC to 8.4V DC
Recharge time	3.5 hrs. from depleted to charged
Reference method	Automatic calibration using internal reference
Light source	Replaceable harmless Tungsten bulb
Water Resistant:	Designed for IP 54 (International Protection Rating).
Operating Temp Range	5 to 40°C.
Storage Temp Range	-20 to +70°C

2. Safety

Read this section carefully before connecting and operating the instrument and the accessories!!!

2.1 General Safety Instructions

As with all technical instruments, the best possible operating safety can only be guaranteed if general safety precautions as well as special safety instructions in this manual are followed.

The instrument and its accessories comply with the relevant safety regulations. Repairs must be performed by authorized personnel only. Improper repairs could result in considerable damage to the instrument and possible danger to the user.

The microPHAZIR™ and its accessories are designed to be operated in conditions that are safe and comfortable for the operator in a typical manufacturing, material testing, and QC environments (I.P. 54 conditions). As with any electrically powered device, there are conditions that may cause harm to a) the instrument or b) to the user by exceeding the instrument's design limits.

2.2 Unsafe operation

If the instrument is damaged or not functioning properly, it should be switched off and not used until it has been properly repaired or replaced. Operation of an improperly functioning or damaged instrument can result in incorrect readings and even danger to the operator.

Conditions that may harm the instrument:

- Steam
- High Humidity (moisture condensing conditions)
- Extreme ambient temperatures below 5°C (40F) or above 45°C (110F)
- Strong electromagnetic (motors or transformers) or electrostatic fields
- Strong vibrations and impacts
- Contact with oxidative, corrosive and caustic atmospheres such as, but not limited to chlorine gas, hydrochloric acid, ammonia.
- Contact with oxidative, corrosive and caustic liquids, such as, but not limited to concentrated hydrogen peroxide, sulfuric acid, aqueous sodium hydroxide.

Conditions that exceed the instrument's design:

- Immersion in water and electrically-conductive liquids
- Combustible atmospheres due to flammable gases
- Burying in dirt
- Long-term exposure to solvent vapors, including methylene chloride
- Flammable liquids, e.g. kerosene, gasoline, diesel, oil, alcohols, ketones

Failing to follow these instructions may result in harm to the instrument or user. If the instrument is damaged due to exposure to any of these conditions, even occasional, your warranty will be voided. Please contact Thermo Scientific if you require modifications to permit the instrument to work in these harsh conditions.

3. Operation

3.1 Unpacking

The microPHAZIR™ is shipped in a padded case that can be used for storage and transport of the instrument.

We strongly recommend using the supplied container for transportation and storage and return if necessary to properly protect your instrument.

Included with the microPHAZIR™ are the following items:

- 1 microPHAZIR™
- 1 USB cable
- 1 spare microPHAZIR™ rechargeable battery**
- 1 battery charger
- 1 0.050” Allen key
- 1 Phillips screwdriver
- 1 CD or printed operating manual
- 1 spare bulb
- 1 internal reference standard

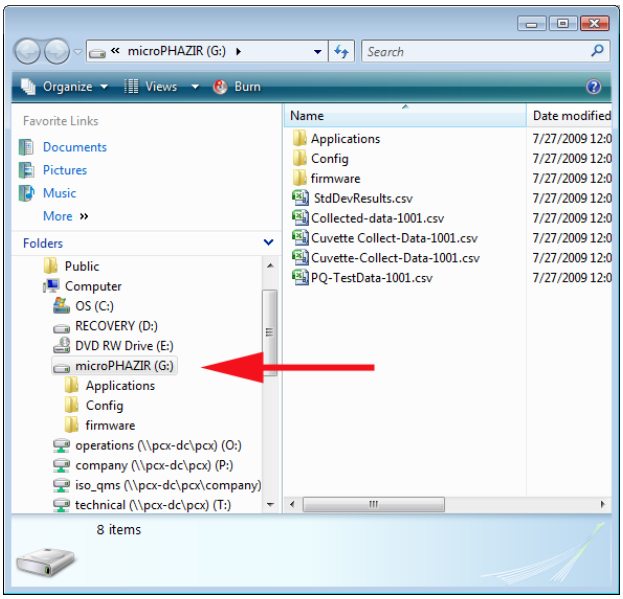
***Please note: A battery comes installed in the microPHAZIR™ in addition to the spare battery. Please refer to Section 5: Maintenance for replacement and charging.*

3.2 microPHAZIR™ Controls

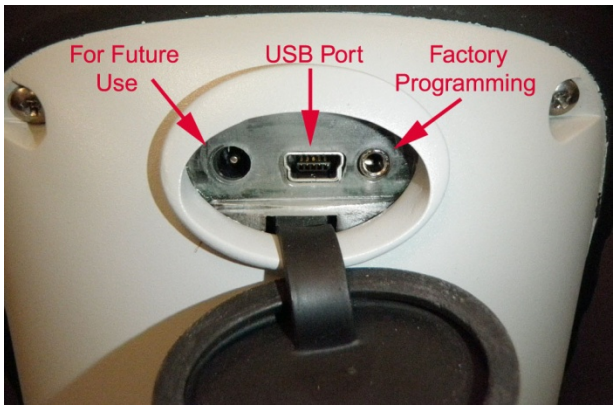
Back View
The following items can be found on the back-side of the microPHAZIR™.

The rear LCD display indicates the operation state of microPHAZIR™ and results.

Under the USB cover is the USB port used to connect microPHAZIR™ to a Windows™ based computer. When connected and recognized by the computer, the words "microPHAZIR" will appear on the computer as a removable storage device similar to current digital cameras or USB memory keys:



The USB connection can be used to download scan-data from the microPHAZIR™ and upload new or upgraded applications to the microPHAZIR™. There are two additional ports. The one on the right is a programming port for factory use only. The one on the left is for future use and will enable operation of the microPHAZIR from an external power source.


For Future Use
USB Port
Factory Programming

TOP VIEW

The following items can be found on the top-side of the microPHAZIR™.

The Color Display is the main method of communicating analysis data to the user. The microPHAZIR™ uses a transflective display technology for easy visibility indoors and outdoors, accommodating a variety of work environments. At the top of the display the current time, battery state of charge, scan number, and signal level as % full scale indicators can be found. Other features displayed on the screen will vary depending on the application used.

The battery indicator is green for an indication of the charge level. The indicator turns into flashing red when the battery is nearing complete discharge (15 minutes of operation left).

Navigation Keys: These buttons can be used to navigate up, down, left and right between the various menu items.

Soft Keys: The function of these buttons is displayed on the screen directly above them. In the picture above the right soft key is labeled “Config”. The functions of the soft keys can change for different screens and applications.

Power Switch: To turn the microPHAZIR™ on, press and release this button. To turn the microPHAZIR™ off hold the button down until the screen indicates the microPHAZIR™ is powering down. A short wait period is required while the onboard computer initializes or shuts down properly.

In addition to the above controls there is a trigger (see microPHAZIR overview) that initiates the measurement of a spectrum. An optional barcode reader is also available.

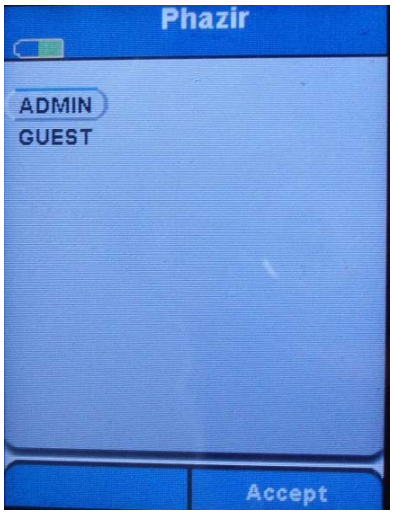
3.3 Software operation

The microPHAZIR™ is a flexible analysis platform that can run several different applications. The active application is the application that is loaded into the microPHAZIR™ memory. In this section the application “Collect data” is described. This application is preloaded into this unit along with any other applications the customer may order. Usage of other applications will be very similar but may vary in screen layout or order of presented options.

3.3.1 microPHAZIR™ Startup and User Log On

The microPHAZIR™ is turned on by pressing the power button on the top.
The first two screens displayed will indicate the unit is starting up and then loading software.

This process should take approximately 30 seconds. The next screen will indicate the light source is turned on and performing an initial calibration. The microPHAZIR™ uses a harmless tungsten light source requiring no precautions when operating it.



If the User Login function is enabled, the user selection screen, shown above, will be displayed. Factory default is for the User Login feature to be disabled, but it will be enabled upon customer request.

Each microPHAZIR™ is configured with two user accounts named Admin and Guest. These user accounts are configured with no password required as the default. User accounts including passwords can be configured by the system administrator using the PHAZIR Setup Utility software.

The Admin user has full access rights to all Configuration menu functions on the microPHAZIR™. In Section 4, all menu items are described.

To select the user, use the navigation keys to highlight the user and press the “Accept” soft-key.

Once the initial calibration is complete the microPHAZIR™ is ready for operation. It is wise to perform a PQ (Performance Qualification) test periodically or after any event, such as dropping the instrument, which might cause misalignment. The PQ test will verify the instrument is operating properly. This test is described in section 4.2.

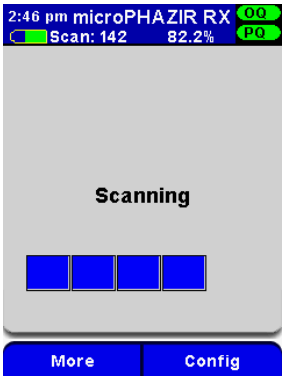
3.3.2 Sample Measurement

The microPHAZIR™ is capable of running many different analysis programs called Applications. Applications are defined using a "Script", which is a set of instructions and mathematical equations that define how the microPHAZIR™ will perform the measurement, analyze data, record data and display results.

When the microPHAZIR™ is turned off, the Script in use will be automatically loaded the next time the microPHAZIR™ is turned on.

NOTE: the trigger need only be depressed until a click is felt and then it should be released. The microPHAZIR™ ***will perform the scan until the measurement is complete.***

During the measurement the following screen is displayed:



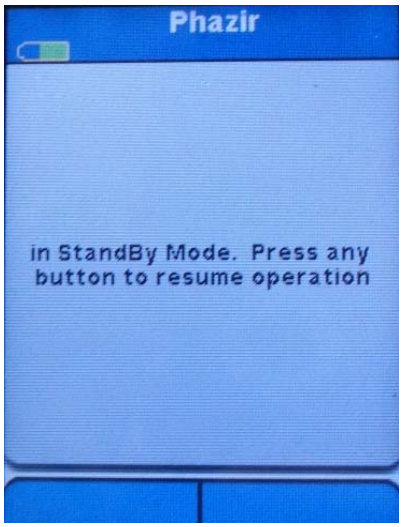
During the measurement, the user should keep the sample in contact with the microPHAZIR™ and should not move it. The Scan progress is indicated on the main LCD screen by a progress bar during the measurement. In addition, the rear LCD screen says "scanning" and "measurement complete" at the end of the scan. The number of scans may vary depending on the application in use. The rear LCD screen will also indicate when the measurement is complete and contact with the sample is no longer required. The result is displayed on both LCD screens.

Note: Each time a sample is measured on the microPHAZIR™*, the "Scan Number" indicator located at the very top of the screen is incremented. This number is recorded in all data files to identify the particular measurement and can be used to match data with sample information. The number displayed AFTER the scan is complete is the value that is recorded with the scan that was just completed.*

3.4 Standby Mode

After long periods of inactivity, the microPHAZIR™ will automatically switch into Standby Mode to conserve battery power. In Standby Mode the light source is turned off but the processor is kept running. The length of inactivity before Standby Mode is activated is

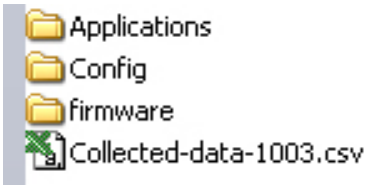
set for each application in the script. During Standby Mode the following screen is displayed:



To resume operation from Standby Mode, press any button. The light warm up screen will be displayed, followed by a new background scan.

3.5 Downloading data from the microPHAZIR™

With both a computer and the microPHAZIR™ turned on and operating properly, connect the microPHAZIR™ to the computer using the USB cable provided. The screen of the microPHAZIR™ will first say “preparing data” and then “USB cable attached”. On your computer, a removable storage device called “microPHAZIR ” should then appear as an additional drive. When opening the drive, you will find the following folders:



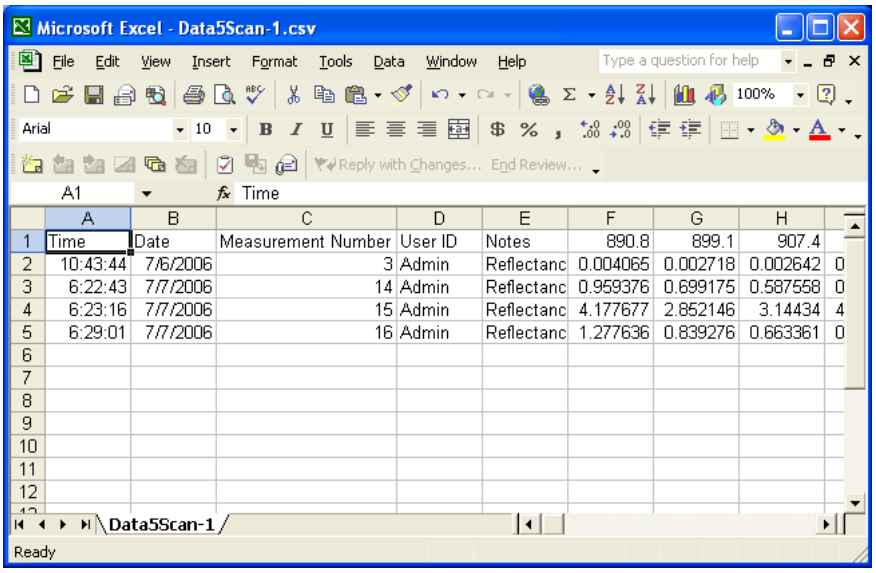
Application scripts reside in the **Applications Folder** which can be accessed to add new applications or upgrade current applications (e.g. adding additional materials to be identified etc…).

The Config and firmware folders contain information used by the microPHAZIR™ and normally should not be accessed by users. The Config folder also contains the group ID and Sample Info files.

Logged scan data files can be found in the top level of the drive. In the example above, the file “Collected-data-1003.csv” is a data file containing measured spectra. 1003 is the instrument serial number. Data files are saved in an ASCII comma separated value

format (csv). The “csv” extension is added to the file name so that it can be opened with Excel by simply clicking on it.

To review a data file, it is best to copy it from the microPHAZIR™ to the PC using standard Windows methods (copy and paste, or drag and drop) and open the file with Excel by double clicking on it. Below is a typical view from Excel:



	A	B	C	D	E	F	G	H	
1	Time	Date	Measurement Number	User ID	Notes	890.8	899.1	907.4	
2	10:43:44	7/6/2006	3	Admin	Reflectanc	0.004065	0.002718	0.002642	0
3	6:22:43	7/7/2006	14	Admin	Reflectanc	0.959376	0.699175	0.587558	0
4	6:23:16	7/7/2006	15	Admin	Reflectanc	4.177677	2.852146	3.14434	4
5	6:29:01	7/7/2006	16	Admin	Reflectanc	1.277636	0.839276	0.663361	0
6									
7									
8									
9									
10									
11									
12									

The column headings in this file have been designed to be self-explanatory. Each spectrum occupies a row of the spreadsheet. Starting with column F, the wavelengths are displayed in the top row with the Log (1/R) data below. The data saved in this format is compatible with most chemometric software packages with minimal editing.

While this format is typical, other formats are possible. The data file format is determined by the Application. Some Applications save only the identification results, for example "Cotton" from the fabric identification script might only be saved in the file and not the spectral information. Other Applications may save no data at all.

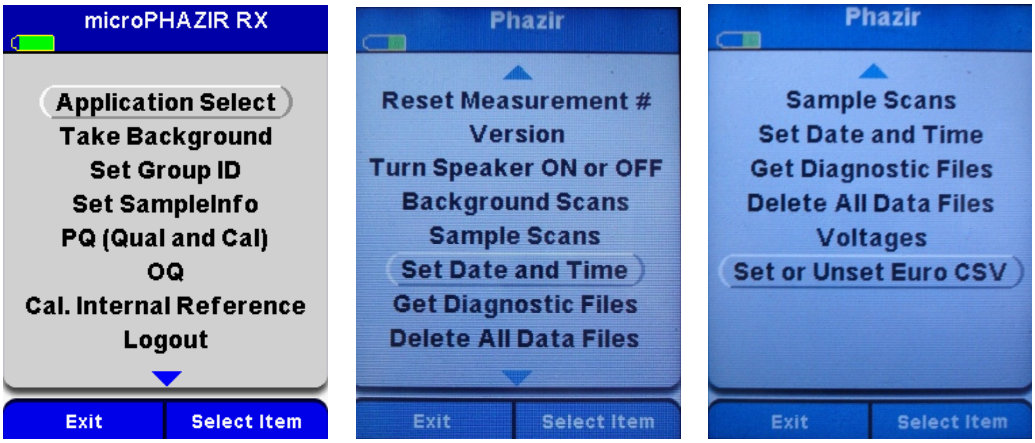
After transferring data to the PC, click on the "Safely Remove Hardware" icon in the task bar. "Safely Remove" the microPHAZIR from the USB connection list before unplugging the USB cable.

Failure to use the Windows safe removal function may result in corrupt or missing data on the microPHAZIR™.

4. microPHAZIR™ Configuration Options

This section will describe the complete set of available configuration options. By pressing the "Config" soft key the configuration menu will appear on the screen. The available menu items are dependent on the selected user account permissions and the microPHAZIR application that has been selected.

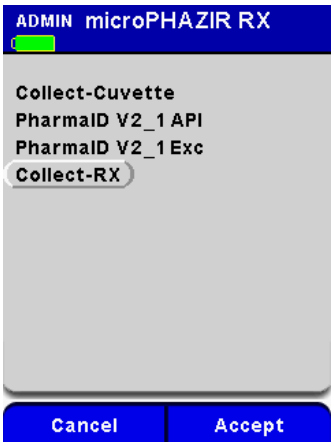
The three screens below show all of the Configuration menu items that are accessible from the Collect application. Other applications will usually have a smaller number of menu items available.



To select a configuration option, navigate to the option using the directional navigation keys and then press the “Select Item” soft-key.

4.1 Application Select

This option presents a list of available applications (also referred to as scripts):
Note: depending on the permission level of the logged-in user, application selection may not be available.



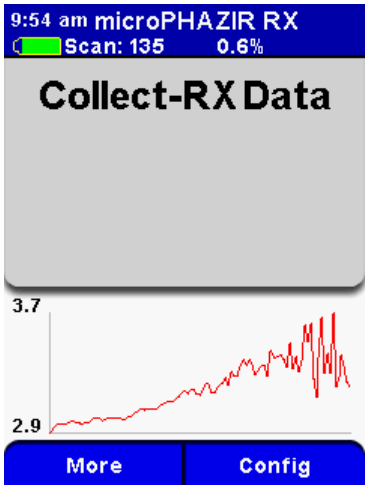
Of the 4 applications listed here, “Collect” is the only standard application included on all microPHAZIR™ units. The additional applications are commercially available from Thermo Scientific.

Note that after selecting a new application from this menu, a new background measurement will be performed automatically.

4.1.1 Collect

The data Collect application is for recording raw spectra without data pretreatment or predictions. The spectral data can be later downloaded to a PC. This application is

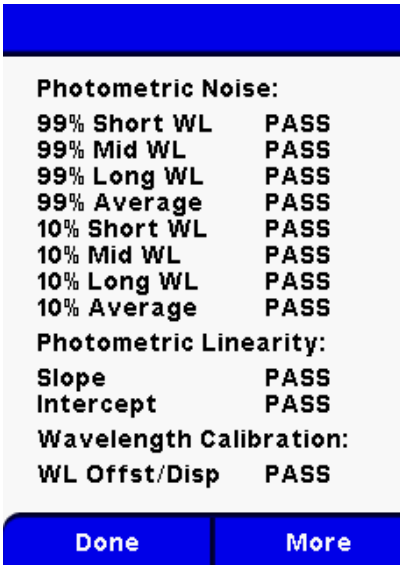
typically used for collecting raw data that will subsequently be used for chemometric modeling and application development. At this point, hold the microPHAZIR™ against the sample, press the trigger, and record the new spectra. The screen will appear as shown below. Pressing the “more” button will show an expanded view of the spectrum.

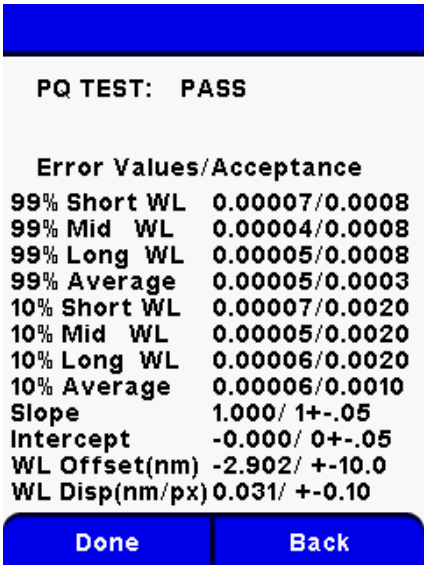


Record the scan number for the resulting spectra. Once spectra of all samples are collected, the data can be downloaded from the microPHAZIR™ into your PC. See section 3.5 for further instructions.

4.2 PQ (Performance Qualification)

PQ is a function which tests the microPHAZIR's optical performance for wavelength accuracy, photometric linearity, and photometric noise. The test results are compared against established acceptance criteria, with a result of either Pass or Fail for each test. This test should be performed on a regular basis, such as every day of use or every week, and if some event occurs (such as dropping the instrument) that might affect its performance. After selection of this function in the config menu, the series of measurements are made automatically. When the tests are complete the system will automatically evaluate and display the results. Each test result is displayed with a PASS or FAIL result. Press the "More" soft-key to view the actual, measured values and acceptance criteria for each test. By pressing the "Done" soft-key, the screen returns to the config menu. By then pressing the "exit" soft-key you are returned to the application you were using before doing the PQ test.



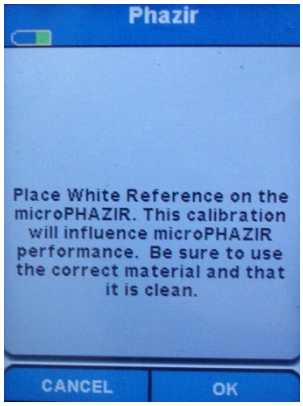


4.3 Take Background

This option allows the user to refresh the Background measurement. This step can be performed from time to time to account for long term variations in the light-source output and environmental conditions. Selecting this option automatically performs the same background measurement as when the microPHAZIR™ was turned on. Afterwards you are returned to the application you were using.

4.4 Cal Internal Reference

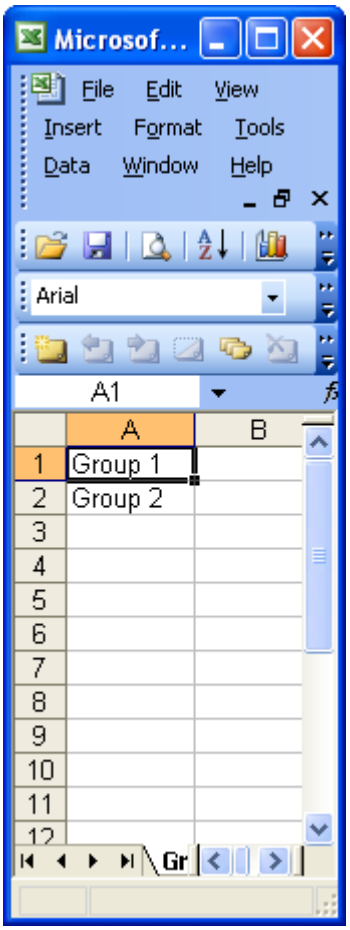
This function in the config menu is only available when the “Collect” application is loaded into memory. When asked to do so, place the internal reference standard on the microPHAZIR™ as shown in the screens below. After pressing the “OK” soft-key, the process proceeds automatically. At the end of the process, you will be returned to the collect application. This function is to correct for any slight alignment changes that may occur when the plastic nose is removed and should be run if the light bulb is changed.


Phazir
Place White Reference on the microPHAZIR. This calibration will influence microPHAZIR performance. Be sure to use the correct material and that it is clean.
CANCEL
OK

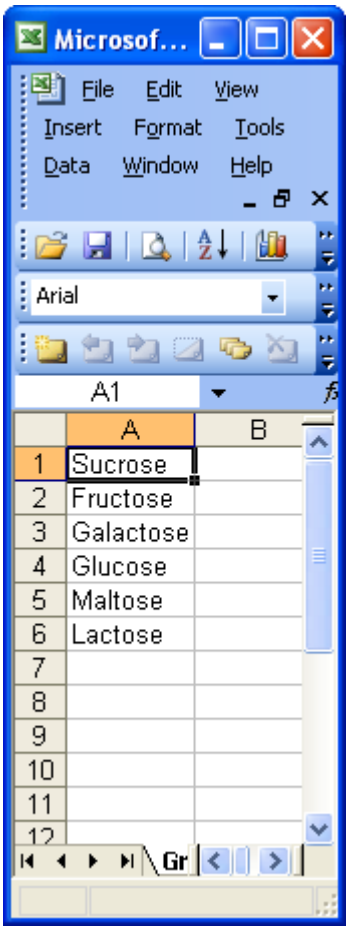
4.5 Set Group ID

The Group ID is a text field that is added to the data file created by the Collect application. It is also available for other applications if it is listed in the config menu for that application. This is useful during subsequent data analysis for identification of the scan and for classification model development. The microPHAZIR™ is shipped with only two default group IDs in the list; Group 1 and Group 2. However, the user may easily change the list of available groups by plugging in the USB interface and opening the file named GroupIDs.csv in the microPHAZIR/Config folder. This file may be opened with Excel and the new groups may be entered in the first column. Example 1 below shows the list as it appears on a new microPHAZIR. Example 2 shows the list after it was edited for collecting sugar data.

Example 1:

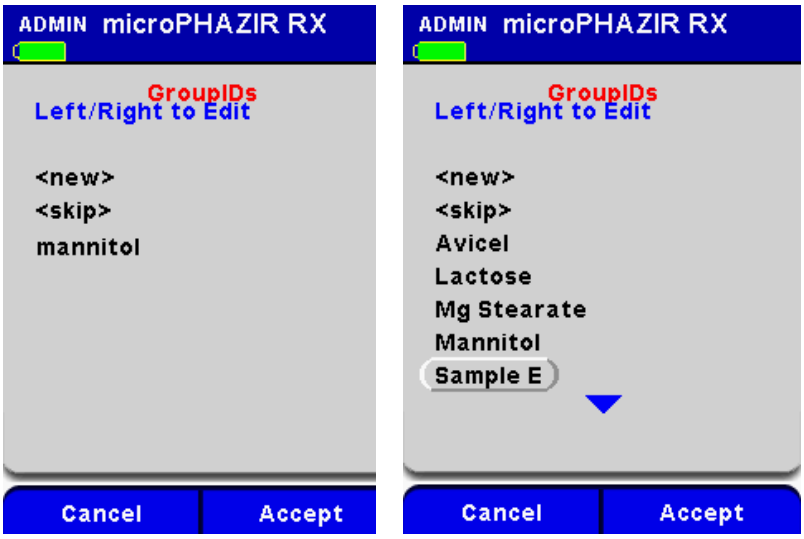


Example 2:



The file should be re-saved under the same name and it must be saved as a “csv” file type. (Normally this file type will be saved automatically by Excel since it was the original file type).

Group IDs are selected by using the up/down arrow keys to highlight the desired text field. The “Accept” button is used to select that value. The Group ID will appear in the Collect application on the main screen so the user can easily see the current value. As previously mentioned, the Group ID is also saved in the data file with each spectrum. By selecting “skip” the user is returned to the config menu.



New Group IDs may also be entered manually (character-by-character) directly on the microPHAZIR by selecting “new”. The first character can be selected using the up/down arrow. Additional characters can be selected by using the right arrow key. Once editing is complete, press the “Accept” soft button.

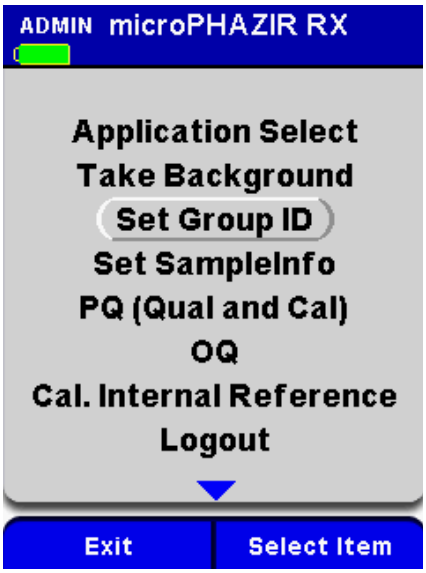
See the PHAZIR Tools User manual for more detailed information regarding Group IDs.

4.6 Set Sample Info

Sample Info provides the ability for the user to store additional information about the sample such as the supplier, lot number, container number etc. Up to 5 Sample information fields may be included for each measurement.

The Sample information fields are defined within the microPHAZIR Application by the Thermo Scientific Method Generation Software. The sample information lists can be edited manually (character-by-character) or by constructing lists by editing the .csv files located in the microPHAZIR/Config directory. Thermo Scientific can install custom “Sample Info” files upon request.

Inputting Sample Information is very much the same as entering Group ID except that up to 5 information fields may be supplied. If multiple Sample Information fields are configured, each Sample Information field is sequentially presented to the operator.

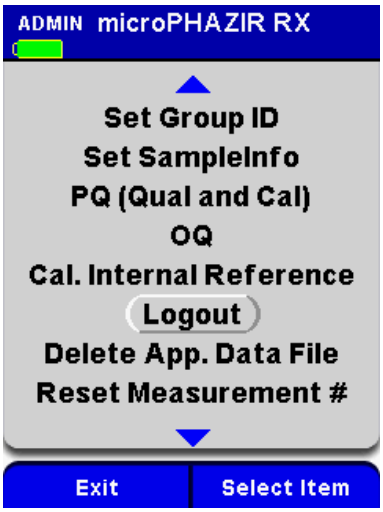


The default Sample Information categories are listed below but these can be customized as required.

Sample Information entries are automatically stored in the microPHAZIR data files along with the spectrum, predicted results, time/date, operator etc.

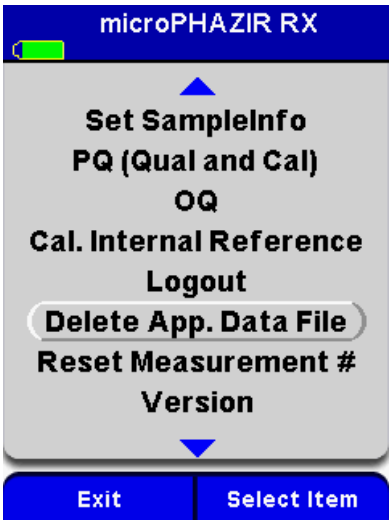
4.7 Logout

The Logout menu option logs the current user out and prompts a new user to login to the microPHAZIR™.



4.8 Reset Measurement

This function resets the scan number to zero. The measurement scan number automatically increments by 1 after each measurement. Selecting Reset Measurement # resets the starting value to 0. A scan must be performed before shutdown to retain the reset measurement number.



4.9 Version

This function displays the current version of Firmware running on the microPHAZIR™, the serial number of the microPHAZIR™ and the FPGA version number.

Note: The microPHAZIR serial number can also be found in the battery compartment.

4.10 Background scans

Allows authorized users to change the number of background scans to be averaged for a specific application. This setting temporarily overrides the default application setting, but is not remembered (changes are lost when the application is reloaded).

4.11 Sample scans

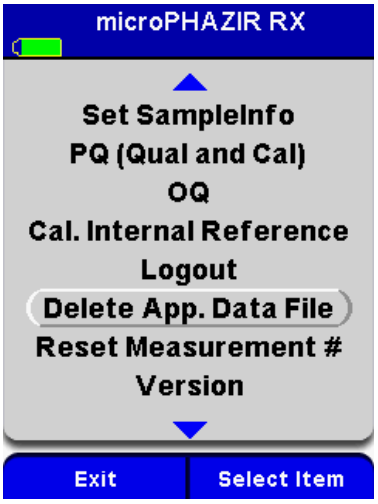
Allows authorized users to change the sample scan counts to be averaged for a specific application. This setting temporarily overrides the default application setting, but is not remembered (changes are lost when the application is reloaded).

4.12 Set date & time

Allows authorized users to set/change the date and time that is displayed on the screen and saved as a time-stamp with scan data. Use the left-right navigational buttons to make the changes and press “accept” soft-key to store the resulting date and time.

4.13 Get Diagnostics Files

By selecting this item from the **config** menu, it will be possible to download copies of certain system files the next time the USB cable is attached. This is useful for trouble-shooting problems with the microPHAZIR™.



4.14 Delete All Data Files

Selecting this item deletes the data files for all the applications on the microPHAZIR™.

4.15 Delete App. Data File

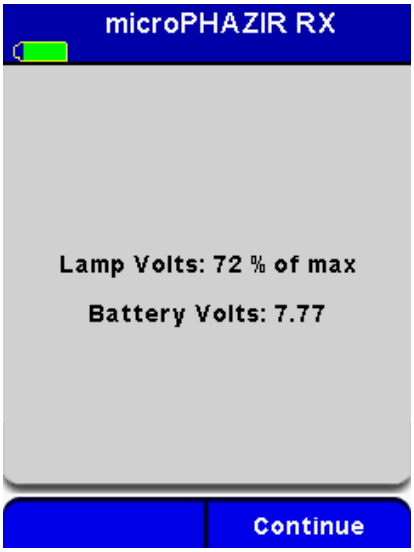
This function just deletes the data file for the application that is currently active.

4.16 Turn Speaker ON or OFF

This function turns ON and OFF the “beep” that occurs with each button press and at the completion of a scan.

4.17 Voltages

This function displays the percentage of maximum voltage that is being supplied to the lamp (light source). This value is determined by the application in use and may be a fixed value or it may be automatically set by the application during calibration. In addition this function provides a measure of the battery voltage.



4.18 Set/Unset Euro CSV

This function changes the delimiting character in the ASCII version of microPHAZIR process data files in order accommodate data import requirements of different languages. The standard setting is a comma “,” delimiter. If this option is set, the value delimiter is changed from a comma to a semi-colon “;” and decimal points within numeric values are changed to commas.

5. Maintenance

5.1 The microPHAZIR™ Battery Charger

The battery charger was developed specifically for this battery system and provides the means for a fast and safe charging of the battery pack in the microPHAZIR™ instrument. It is easy to use and enables the maximum use of the battery pack capacity, while at the same time providing the highest possible protection.

Using a Charger other than the one provided with your instrument may result in damage to the instrument.

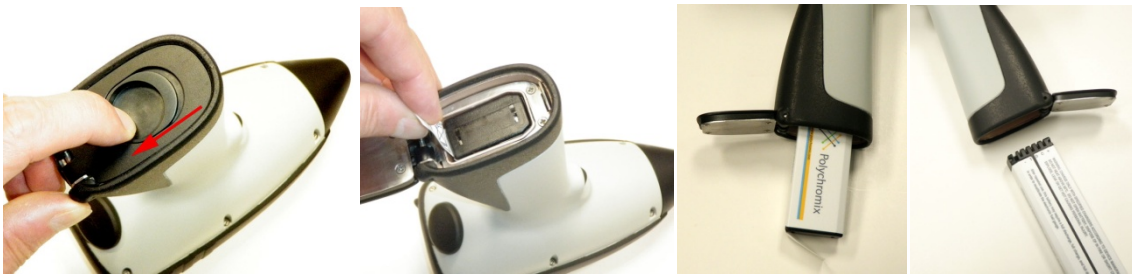
To charge the battery, please proceed as follows:

1. Do not remove battery while the unit is turned on. This could result in loss of data or instrument malfunction.
2. Turn the unit off and remove the battery from the microPHAZIR™.
3. Plug the battery into the charger.
4. The charging process can be monitored, by looking at the colored LED indicator on the charger.
   - Green flashing – battery is charging.
   - Green solid – battery is fully charged.
   - Red – error.
5. Estimated charging time for a full charge is 3.5 hours.
6. Charge state of any battery can be determined by pressing the button on the battery and reading the percent of charge on the LED indicator on the battery.
7. When microPHAZIR™ is turned on, the charge level of the batteries is indicated at the top of the main LCD display. When the charge is sufficient, the indicator is green. When the charge level is too low, the charge indicator flashes red. This means the microPHAZIR™ battery should be changed immediately. Failure to do so could result in loss of data.

- Use only battery packs certified by Thermo Scientific. (cf. Spare Parts)
- Never short circuit the contact surfaces of the battery
- Never expose the battery to open flames.

5.2 microPHAZIR™ Batteries and Battery Charging

To change the battery pack, first turn the microPHAZIR™ off. Remove the battery pack by opening the latch on the bottom of the handle and pulling the battery tab as shown below. Replace with a new one by sliding the battery pack into the handle and pushing firmly into place. The battery will only fit in one orientation. Close the latch on the bottom of the handle. Turn the power back on.



To charge the battery, follow the instructions below.

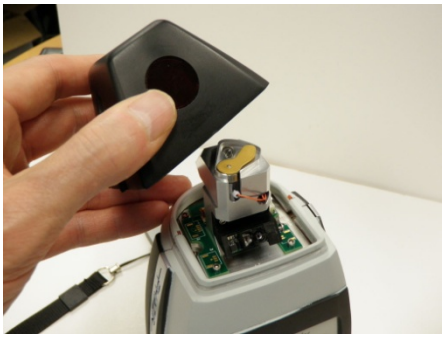
To insert battery in charger:
1.Orient battery as shown
2.Push battery to back right corner
3. Gently move battery toward front of charger until the charging electrodes engage.
4. Push down on the battery to fully engage.
5. Light on charger will blink while charging.
6. Light on charger will remain on when charged.

5.3 Changing the Bulb

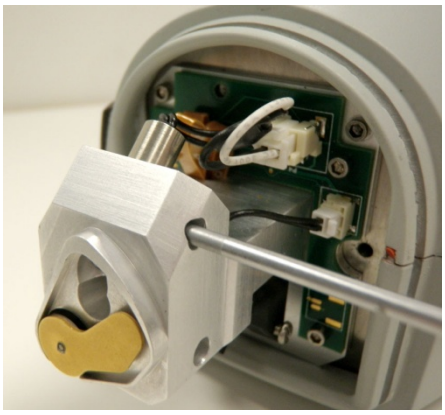
Like any light bulb, the light source in microPHAZIR™ will need to be replaced from time to time. A spare bulb kit is included with the microPHAZIR™ when it is purchased. Additional bulbs can be obtained from Thermo Scientific.

Step 1: With the microPHAZIR™ turned off, remove the two screws holding the nose cover to the instrument.

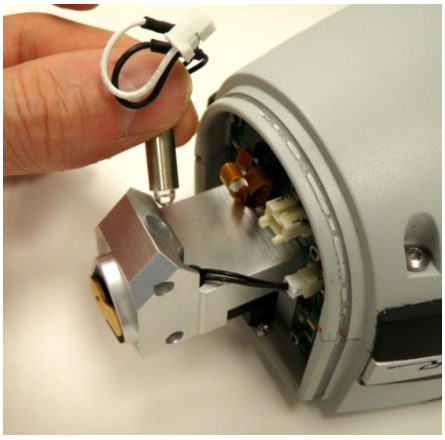
Step 2: Remove the nose cover.



Step 3: Locate the setscrew securing the light bulb in place. Loosen this setscrew with the Allen key provided and extract the bulb. The connecting wires should come out with the bulb to reveal a connector.

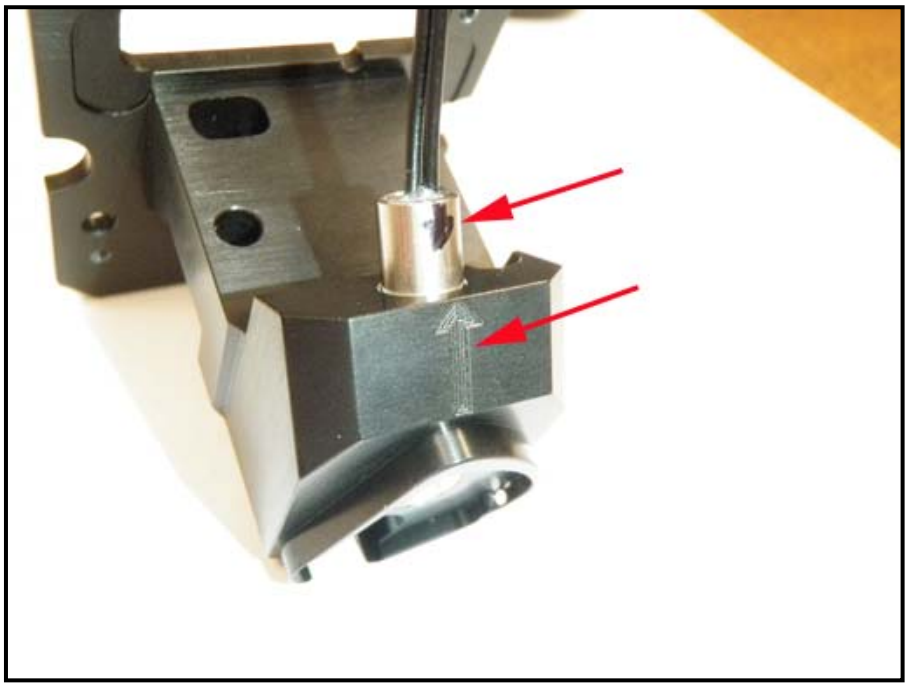


Step 4: Disconnect the connector by squeezing the release tab and remove the bulb being careful not to touch or damage the other components in the nose.



Final Steps:

Step 5: Insert a new bulb into the socket as far as it will go. Orient the mark on the light bulb with the arrow on the mount (as shown below) and secure it by tightening the set screw.



Step 6: Attach the wire connector on the bulb to the plug connector on the microPHAZIR™.

Step 7: Attach the nose cover using the two screws.

Step 8: Power on the microPHAZIR™ to verify that the new bulb is working properly. It is necessary to run the "Cal Internal Reference" function under the config menu before anything else. Then run a PQ test and one of the applications on the microPHAZIR™ to ensure that everything is functioning properly.

5.4 Cleaning the Instrument

For optimal performance it is necessary to keep the measurement sampling window clean and dry. Please use a clean, soft cloth and gently wash with water or alcohol and then dry. (Do not use other solvents like acetone!) The outside of the microPHAZIR™ including the display can be cleaned with a cloth dampened with water.

- The standard issue microPHAZIR™ is not designed for immersion in water.

6. Fault Diagnosis and Troubleshooting

1. The light source does not light up with the microPHAZIR™ turned on.

Verify that the main LCD screen is lit to ensure that batteries are charged.
Verify that the microPHAZIR™ is not in standby mode by looking at the screen for a standby mode message. If it is, press any button on the unit and wait for the light source to warm up.
If the batteries are charged and microPHAZIR™ is not in standby mode, replace the bulb following instructions in the maintenance section. If the bulb still does not light up when the power is turned on please contact a service center for further evaluation.

2. My application is not predicting properly

Run the PQ (performance qualification) test in the config menu to verify that the instrument meets the performance specifications and is still calibrated. Check to be sure that the sampling area is clean. If the problem persists, please contact a service center for further evaluation.

3. Other problems

Please contact Thermo Scientific for assistance.

7. Spare Parts and Service

microPHAZIR™ is designed for use in an industrial environment. Should you experience any problems, the following parts can be obtained from Thermo Scientific:

- microPHAZIR™ 7.2V Li-ion smart charger (DC Output 8.4V – 1.0A)
- Spare Li-Ion battery
- Replacement tungsten bulb
- Wrist lanyard
- Hip holster
- Documentation CD
- Table-top stand
- Carrying case
- USB cable
- Liquid vial adapter
- Glass vial adapter for reflectance

If you require a part that is not listed above, please contact:

Thermo Fisher Scientific
46 Jonspin Drive
Wilmington, MA 01887 USA
Tel.: 978-657-5555
E-mail: support.chemid@thermofisher.com

8. Warranty

Thermo Scientific, Inc. (Thermo Scientific or Seller) warrants that its products will be free from defects in materials and workmanship under normal use and service in general process conditions for the effective period set out below. This warranty and its remedies are in lieu of all other warranties expressed or implied, oral or written, either in fact or by operation of law, statutory or otherwise, including warranties of merchantability and fitness for a particular purpose, which Thermo Scientific specifically disclaims. Thermo Scientific shall have no liability for incidental or consequential damages of any kind arising out of the sale, installation, or use of its products.

Thermo Scientific's obligation under this warranty shall not arise until Buyer notifies Thermo Scientific of the defect. Thermo Scientific's sole responsibility under this warranty is, at its option, to replace or repair any defective component part of the product within the warranty period.

Except in the case of an authorized distributor or seller, authorized in writing by Seller to extend this warranty to the distributor's customers, the warranty herein applies only to Buyer as the original purchaser from Seller and may not be assigned, sold, or otherwise transferred to a third party.

No warranty is made with respect to used, reconstructed, refurbished, or previously owned Products, which will be so marked on the sales order and will be sold "As Is".

BUYER'S SOLE AND EXCLUSIVE REMEDY UNDER THIS WARRANTY IS THAT THE SELLER EITHER AGREES TO REPAIR OR REPLACE, AT SELLER'S SOLE OPTION, ANY PART OR PARTS OF SUCH PRODUCTS THAT UNDER PROPER AND NORMAL CONDITIONS OF USE, PROVE(S) TO BE DEFECTIVE WITHIN THE APPLICABLE WARRANTY PERIOD. ALTERNATELY, SELLER MAY AT ANY TIME, IN ITS SOLE DISCRETION, ELECT TO DISCHARGE ITS WARRANTY OBLIGATION HEREUNDER BY ACCEPTING THE RETURN OF ANY DEFECTIVE PRODUCT PURSUANT TO THE TERMS SET FORTH HEREIN AND REFUNDING THE PURCHASE PRICE PAID BY BUYER.

Place of Service

Seller shall use its best efforts to assist buyer to resolve all warranty related issues through Thermo Scientific customer and technical support as soon as reasonably practicable after notification by the Buyer of a possible defect. However, the Seller reserves the right to require the Buyer return the Product to Seller's production facility, transportation charges prepaid, when necessary, to provide proper warranty service.

Effective Date

The effective date of this warranty shall begin on the date of shipment/date of invoice, whichever is later. Products are warranted to be free from defects in materials and workmanship for parts and labor for 1 year with the exceptions indicated below:

Limitations

Products are warranted to be free from defects in materials and workmanship for parts and labor for 1 year with the following exceptions:

- Any components of the system that are in direct contact with corrosive materials are warranted to be free from defects in materials and workmanship at time of delivery but cannot be further warranted due to the unknown nature of the use of the product.

- Consumable items such as lamps, cuvettes and optical filters are excluded from this warranty. If a lamp undergoes a catastrophic failure (e.g., no light at all) within 90 days of shipment from the factory, it will be replaced at no charge.

- Loss, damage, or defects resulting from transportation to the Buyer's facility, improper or inadequate maintenance by Buyer, software or interfaces supplied by the buyer, unauthorized modification or operation outside the environmental specifications for the instrument, use by unauthorized or untrained personnel or improper site maintenance or preparation.

- The sole and exclusive warranty applicable to software and firmware products provided by Seller for use with a processor internal or external to the Product will be as follows: Seller warrants that such software and firmware will conform to Seller's program manuals or other publicly available documentation made available by Seller current at the time of shipment to Buyer when properly installed on that processor, provided however that Seller does not warrant the operation of the processor or software or firmware will be uninterrupted or error-free.

    - Products that have been altered or repaired by individuals other than Thermo Scientific personnel or its duly authorized representatives, unless the alteration or repair has been performed by an authorized factory trained service technician in accordance with written procedures supplied by Thermo Scientific.

    - Products that have been subject to misuse, neglect, accident, or improper installation.

    The warranty herein applies only to Products within the country of original delivery. Products transferred outside the country of original delivery, either by the Seller at the direction of the Buyer or by Buyer's actions subsequent to delivery, may be subject to additional charges prior to warranty repair or replacement of such Products based on the actual location of such Products and Seller's warranty and/or service surcharges for such location(s).

    The warranty period for data processing equipment, including data storage devices, processors, printers, terminals, communication interfaces, tape drives, and/or all similar devices, is in all cases limited to ninety (90) days from the date of shipment to Buyer.

    Repaired products are warranted for 90 days with the above exceptions.

Appendix A: Usage Guide

A1 First time operation

When the microPHAZIR™ is first turned on, verify that the battery is charged.
If the batter is not charged, please refer to Section 5 (*Maintenance)* for a description of the batteries and the charging procedure. The instrument always has the "collect" application pre-installed in memory and may have other applications installed as well.

A2 Notes on measurement

The microPHAZIR™ makes diffuse reflection measurements of materials that are placed in contact with the nose of the instrument. These are usually solids or powders. The material must be reflective enough so that the light level reaching the instrument is above a threshold set by the application.

General Notes

- The sample to be measured **must be in contact** with the nose of the microPHAZIR™ to make a measurement and it **must not be moved** during the measurement time.
- Light must reach the material of interest to be properly measured. The microPHAZIR™ cannot measure through thick paint, paper, or metals.
- Transparent materials do not reflect much light and will be difficult to measure.
- Sheets of thin transparent material can be measured by using a diffuse reflection, reference material such as Spectralon or Flourilon behind the film.
- Some dark materials, notably those filled with or covered with carbon-black, do not reflect sufficient light for measurement.
- Small pieces of material can be analyzed by carefully placing the sample on a well lit portion of the window.

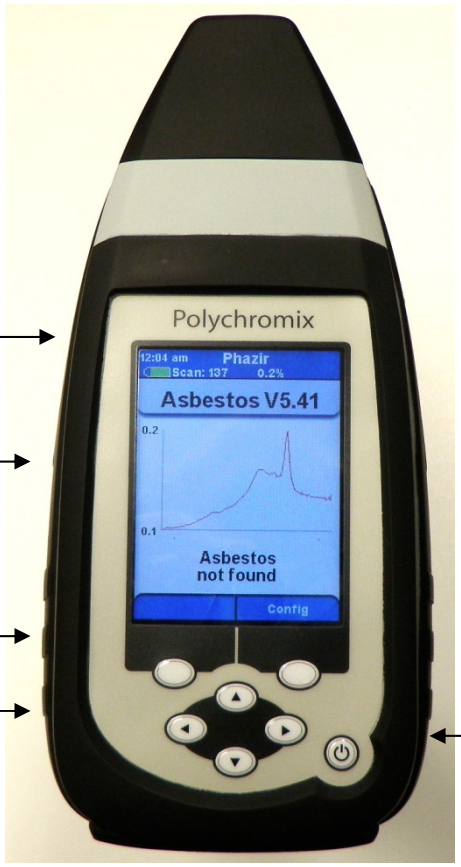
To perform a measurement

Verify that the application you wish to use, such as "Data collection", is loaded.
Press the nose of the instrument against the sample to be measured and pull the trigger. Do not hold the trigger down as this will delay the measurement. The parameters for the measurement, such as the number of spectra/scans to average, are set by the application loaded in the microPHAZIR.

A3 microPHAZIR™ Quick Start

The microPHAZIR™ is a self-contained analyzer. It contains a power supply, a light source, sampling interface, spectrometer and embedded computer. When the appropriate application is loaded, it makes measurements of the material of interest and provides an analysis of the resulting spectrum. Operation is demonstrated with the Collect Data application.

A3.1 Hardware Overview



A3.2 Collect Mode

The collect mode is used in the acquisition of library spectra. It is useful to have a notebook and writing instrument to provide a record of which spectra belong to which of the materials being measured. In general, five readings should be taken from various points on each material. Record in the notebook a detailed description of the sample that allows accurate identification rather than a vague description or serial number.

1. Turn the microPHAZIR™ on by momentarily pressing the power button on the top of the instrument.
2. The microPHAZIR™ will load the most recently used application.
3. If it is not “Collect”, press the soft-key marked “Config.”
4. Using “Application Select” load the “Collect” application.
5. Place the sampling aperture in solid contact with the material and do not move it during the measurement.
6. Pull but do not hold the trigger to begin the measurement. Completion of the measurement will be indicated on both LCD screens.
7. Record in the notebook the measurement number, located on the upper part of the display, along with a description of the material being measured.
8. When all measurements are finished, hold down the power button on the top of the instrument until the main LCD screen indicates the microPHAZIR™ is shutting itself down.

A3.3 Downloading Data

1. If the microPHAZIR™ is not turned on, turn it on by momentarily pressing the power button on the top.
2. Using the supplied USB cable, connect the Windows computer to the microPHAZIR™. The USB connection on the microPHAZIR™ is under the USB cover below the rear LCD screen.
3. On the computer, navigate to the new drive labeled “microPHAZIR”.
4. Copy the .csv file that begins with “<application>Data” to the computer.
5. Eject the microPHAZIR™ by clicking on the “Safely remove hardware” icon in the taskbar.
6. Unplug the microPHAZIR™.

A3.4 Other Applications

Thermo Scientific has available standard applications that can be installed by the user onto the instrument. In addition, new scripts can be written for special applications. Thermo Scientific provides development and maintenance services for new applications for the microPHAZIR™. Some users may wish to develop their own application using the Thermo Scientific Method Generator (PMG) program that runs on a Windows platform and automates the process of creating an application file. Please contact Thermo Scientific for more details.

Appendix B: Vial and Cuvette Adaptor Usage

(***microPHAZIR*** with cuvette adaptor attached)

B1. Introduction
B2. Attaching and de-attaching adaptors
B3. Use of the "Collect Cuvette" application (cuvette and liquid adaptors only)
B4. Making applications using Thermo Scientific MG for use with Cuvette and Liquid Vial Adaptors

B1. Introduction:

The microPHAZIR has several available sample adaptors. The adaptors include:

-Cuvette adaptor for transmission measurements on liquid samples.
-Liquid vial adaptor for transmission measurement on small vials.
-Solids vial adaptor for measuring diffuse reflectance from powder (typically) samples.
-Quick-disk adaptor for locating quick-disk vials and measurement of diffuse reflectance from samples.

All of the adaptors use the same attachment method which is described in section B2. Note that for transmission measurements (cuvette and liquid vial adaptors) the microPHAZIR internal reference should NOT be used since that is only for diffuse reflectance measurements. Instead, reference measurements for transmission measurements are made on either empty adaptors or adaptors with empty cells (cuvette or vial). In order to prevent the microPHAZIR from automatically using the internal reference, a special "Collect-Cuvette" application should be used for collecting data (section B3). When creating applications in Thermo Scientific Method Generator software, an option is available to disable the reference shutter and is described in section B4.

B2. Attaching and De-attaching adaptors:

They may be attached by simply pressing them onto the nose of the instrument until the two side clips lock into the slots. Sometimes this may involve a light rocking motion:

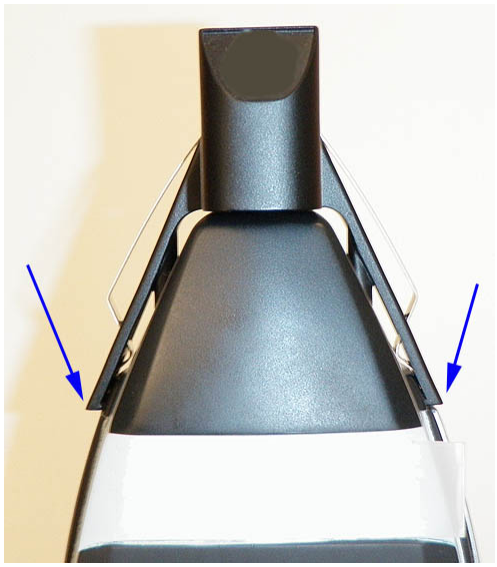


Figure B1. Slide on adaptor until locking clips snap into place (indicated by the blue arrows).

The adaptor is removed by squeezing the two metal release springs simultaneously as shown in figure B2:

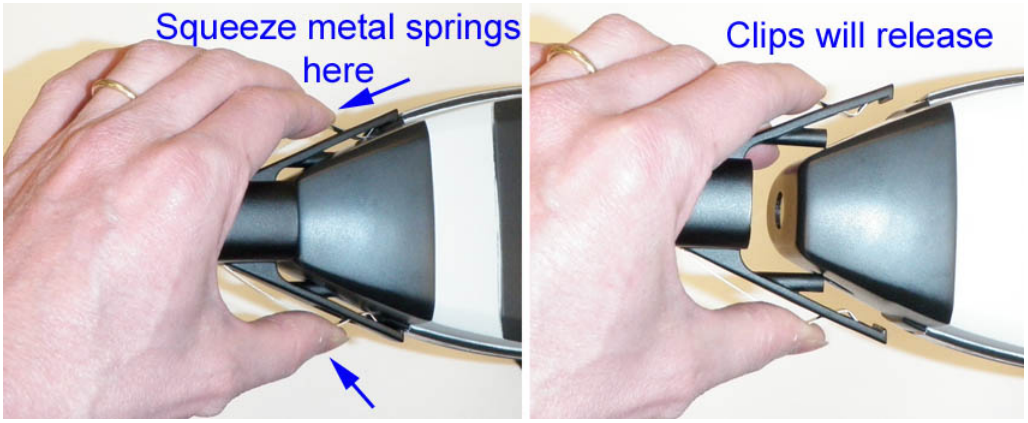


Figure B2. Squeeze the metal release springs as shown and the adaptor should release and slide off of the nose. Note: Care should be taken not to over stress the adaptor arms during removal.

B3. Use of the "Collect Cuvette" application (cuvette and liquid adaptors only):

The Collect Cuvette application is intended for use with the cuvette and liquid vial adaptors and may be downloaded here:

http://www.Thermo Scientific.com/PMG/Collect-Cuvette.zip

This application functions exactly as the normal “Collect” application except that it will ask the user to manually take a reference/background measurement. At this time the user should have the adaptor attached with an empty cell in place (cuvette or vial).

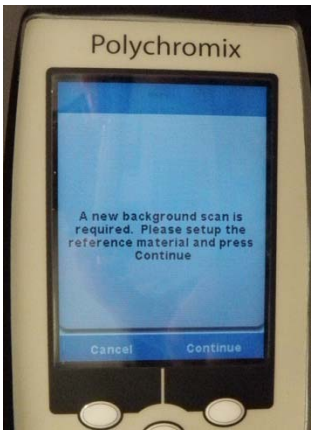

Polychromix
A new background scan is required. Please setup the reference material and press Continue
Cancel
Continue

Figure B3. Request for manual background measurement when using the “Collect-Cuvette” application.

B4. Making applications using Thermo Scientific MG for use with Cuvette and Liquid Vial Adaptors:

Applications made using Thermo Scientific Method Generator (PMG) software for use with the Cuvette or Liquid Vial adaptors should be saved with the “Internal Reference” disabled. The ability to disable the internal reference is a new PMG feature present only in PMG version 3.101 or greater:

http://www.Thermo Scientific.com/PMG/PMG-MostRecent.zip

The internal reference can be disabled from the “Model Parameters” screen that is displayed when the “Create Application” button is pushed:

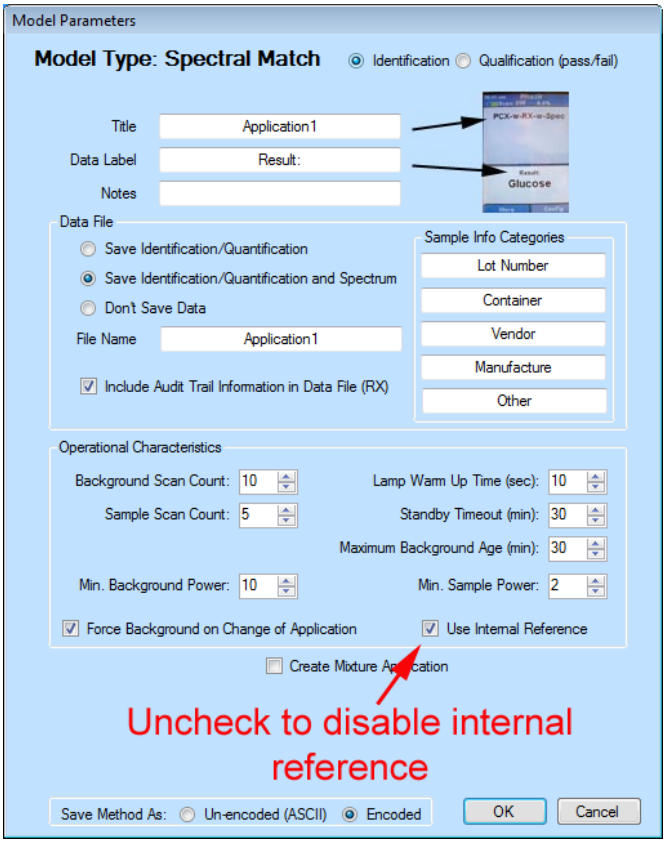


Figure 4B. Location of Internal Reference enable/disable checkbox in Thermo Scientific Method Generator

Appendix C: Barcode Reader Option

The microPHAZIR can be optionally equipped with an integrated barcode reader (part number mPHZR-Bar-1). The barcode reader can read 1-D format barcodes. The barcode scanner option is built into the sampling head of the PHAZIR as shown in Figure 1 below.

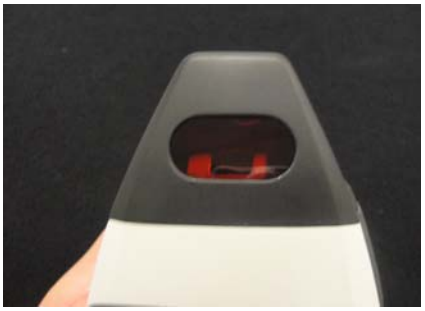


Figure 1

The bar code reader is activated when the Set Group ID or Set Sample Information menu items are selected in the microPHAZIR Config menu. These functions can be accessed by pressing the “Config” soft key and selecting either “Set Sample Info” or “Set Group ID”.

Note: Hold the microPHAZIR so that the barcode reader is at a right angle to barcode.

Procedure for Using microPHAZIR barcode scanner options:

1. Select Config
2. Select “Set Group ID” or “Set Sample Info” depending on your need
3. If “Set Sample Info” was selected select the desired Sample Information field (the available options are dependent on the Sample Information field configuration which is defined within the PHAZIR Application using Thermo Scientific Method Generation software).
4. Press the microPHAZIR trigger. You will notice the red bar code scanner line. (see figure 2)
5. Position the microPHAZIR so that the bar code red line covers the bar code. Try to position the bar code at an approximate right angle to the direction of the bar code scanner in order to get the best bar code reading. Make sure the red line cover the ends of the barcode.

   Note: the bar code scanner will emit the red line for about 4 seconds. If a bar code is not successfully registered within 4 second the light bar code scanner will turn off. To reactive the scanner just press the trigger again.

6. When the barcode is successfully read you will see the barcode information displayed on the microPHAZIR display. Press Accept to save the barcode data.

   (see Figure 3 and Figure 4)

7. Proceed to the next operation step. Note: the bar code value will automatically be saved with subsequent measurements.

Figure 2

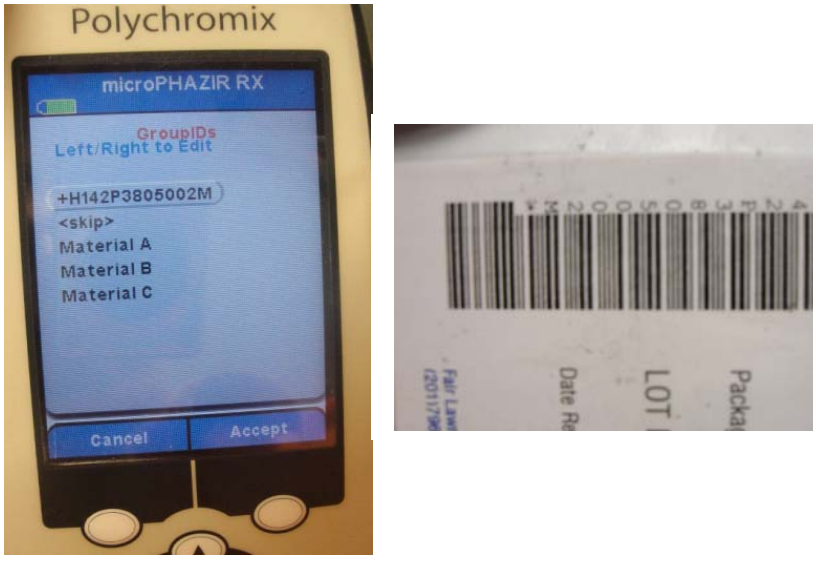


Figure 3

Polychromix
11:09 am microPHAZIR RX
Scan: 787 -0.1%
Collect-RX Data
+H142P3805002M
0.0
0.0
More
Config

Figure 4